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ABSTRACT

An evaluation (involving questionnaires, telephone interviews, focus groups, site visits, e-mail questions, and lab observation) assessed the success in implementing a statewide technology plan for adult literacy programs in Massachusetts that grew out of a set of recommendations developed by the Massachusetts Adult Literacy Technology Team (MALTT), an ad hoc group of practitioners. The evaluation generated lessons about use of technology in adult literacy programs. Findings indicated: a well-developed technology infrastructure throughout the adult basic education (ABE) system; a significant level of access to and use of computer technology and a wide variety of related software by adult learners and program staff; a significant level of Internet access among ABE programs; a great deal of interest among staff and learners to expand their use of technology; two significant barriers (time and cost) to effective use of technology for learners, teachers, and administrative staff; a need for best practice models and technical assistance; a significant level of training and staff development among adult literacy staff; development, refinement, and implementation of SMARTT, a statewide student data and outcome tracking system; and a need to explore opportunities for technology-related funding. Among recommendations were: less focus on hardware acquisition and more of a strategic approach to training, curriculum integration, and maximizing use of existing infrastructure. (YLB)

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An Evaluation of the Use of Technology in Support of Adult Basic Education in Massachusetts

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An Evaluation of the Use of Technology in Support of Adult Basic Education in Massachusetts

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Executive Summary

"Now there is a computer revolution around the world. I need to learn more and more about [the] computer, especially [the] Internet."

"Try to help students understand the computer and maybe teach them as much as possible when there is a little free time because every little bit will help someone's future."

"In my opinion I think technology helps [me] to learn faster than other methods."

"Use computers more often, a lot more computers. Because nowadays that's all there is."

-- comments from adult learners

This report is an evaluation of the implementation of the statewide technology plan for adult literacy programs in Massachusetts. The plan grew out of a set of recommendations that were developed by a group of practitioners who had been meeting as the Massachusetts Adult Literacy Technology Team (MALTT). It was an ambitious, 4-year effort, supported by a substantial commitment of resources by the Massachusetts Department of Education (DOE), to assist programs in the adult literacy system to build the infrastructure, skills, and overall capacity needed for the effective use of technology in support of teaching, learning, and program management. The purpose of this evaluation was to assess the success in implementing the plan, to generate meaningful lessons about the use of technology in adult literacy programs, and to generate a set of recommendations for the next multi-year phase of technology infrastructure development and capacity building in the adult literacy field in Massachusetts. The major findings of the study are as follows:

1) **Technology Infrastructure Development**: Because of the infusion of resources over the period of implementation of the statewide technology plan, there is now, in general, a significantly well-developed technology infrastructure throughout the ABE system. This infrastructure includes desktop and laptop computers, computer networks and Internet access, and a wide range of other technological tools and resources.

2) **General Access and Use**: There is a significant level of access to and use of computer technology, as well as a wide variety of related software, by both adult learners and program staff. The statewide technology plan includes specific targets for the percentages of learners using hardware "regularly." This goal appears to have been achieved as it relates to use of computers, but it does not appear to have been achieved with regard to video and Internet technologies. The various technology applications that provide learners with the opportunity for self-directed, self-paced learning are only being used to a limited degree, with the greatest degree of use being with computer-assisted instruction.

3) **Use of the Internet**: There is a significant level of Internet access among ABE programs. Most programs are connected to the Internet, a significant segment have some form of high speed Internet connection, and many programs report regular (and in some cases "everyday") use of the Internet by both adult learners and program staff.

4) **Widespread Desire for Increased Use**: There is a great deal of interest, among both staff and learners, to expand their use of technology. Specifically, there is a great deal of interest in developing and/or expanding skills training for learners in standard computer applications, in large part because of the relationship of these skills to job placement and career development.

5) **Barriers to Effective Use**: The two most significant barriers to the effective use of technology for learners, teachers, and administrative staff are: time and cost. While there is a great deal of hardware and software that is available to learners and teachers at the program sites, there are a number of factors that are perceived to limit maximum meaningful and effective use of that technology, specifically including inconsistent hardware performance and Internet connectivity and the lack of adequate troubleshooting capacity on-site. (Note: The issue of "time" as a barrier is related to the level of staff proficiency. That is, without a certain "critical mass" of staff skilled and experienced in the use of technology, all aspects of planning and implementing technology-related activities are perceived as unduly time-consuming.)

6) **The Need for Technical Assistance**: Program sites need best practice models and technical assistance regarding various aspects of their use of technology, including:
   - Technology-centered curriculum development and instructional methodology;
   - Space and physical plant issues;
   - Integrated technology planning (i.e., multi-year planning that integrates considerations of hardware, software, educational goals, staff capacity, etc.).

7) **Staff Capacity and the Technology Coordination Function**: There has been a significant level of training and skill development among adult literacy staff throughout the system. However, there are still gaps in the capacity of staff at the program level to use technology effectively and to its potential. Gaps in staff skill and proficiency at the program level cover a wide range, from integrating various types of technology into the curriculum to troubleshooting hardware glitches. Technology coordination at the program level (which includes technology infrastructure development and maintenance as well as staff and learner support) is a critical function that encompasses a wide range of tasks and requires a broad and deep skill set. There needs to be more staff time allocated to this function in order to maximize the effective use of technology in support of teaching, learning, and program management. (Note: This recommendation concerns the overall set of functions related to supporting the use of technology, not necessarily or solely to the position of technology coordinator.) Similarly, the role of the SABES Regional Technologists needs to be clarified so that they can focus their energies on strategically building the capacity of the programs to effectively use technology.

8) **SMARTT**: The development, refinement, and implementation of SMARTT, a statewide student data and outcome tracking system, has been a major undertaking, and is nearly

complete. It is ambitious and important step toward creating meaningful program evaluation and accountability. However, this process is perceived by many programs as having been a major distraction that has served unintentionally as a barrier to the development of their capacity to use technology in support of teaching and learning.

9) **Resource Issues**: Funding and resources are issues that shape, and in some cases limit, programs' ability to use technology effectively. Programs need to explore opportunities for technology-related funding beyond the resources made available in their DOE grant. In addition, programs need to develop strategies, perhaps in the context of their community planning process, for accessing technology resources in their community.

10) **The Next Phase**: Efforts over the past several years to build the technology infrastructure in the adult literacy system and to build the capacity of programs to use technology effectively can be regarded as a successful first phase. As individual programs and the system as a whole enter the next phase of developing the use of technology, there are several overarching principles that should guide decision making:

- In general, there should be less focus on hardware acquisition, and a more strategic approach to training, curriculum integration, and maximizing the effective use of the existing infrastructure;
- There should be a strong focus on identifying, documenting, and disseminating models and best practices related to the various aspects of the successful and effective use of technology in support of teaching, learning, and program management;
- The system as a whole should adopt a strong capacity building focus in which the roles of the program technology coordinators and the SABES regional technologists are clearly and strategically designed, and the resources allocated to these functions be commensurate with the needs of the programs for capacity building support;
- Because the programs are at many different levels of organizational development with regard to the use of technology, the precise needs and capacities of the individual programs should be systematically assessed and any subsequent training, infrastructure development, and technical support should be targeted to the program's stage of development and identified needs. (Note: The rubric in the MALTT plan that defines various levels of capacity and proficiency can serve as the basis for an assessment or self-assessment for both programs and individual practitioners.)

An Evaluation of the Use of Technology in Support of Adult Basic Education in Massachusetts

Introduction and Background

In September 1999, consultants Alan Brickman and Linda Braun were engaged by the Massachusetts Adult Literacy Technology Team (MALTT), the Massachusetts Department of Education (DOE), and the Massachusetts Corporation for Educational Telecommunications (MCET) to conduct an evaluation of the implementation of the statewide technology plan for adult literacy programs in Massachusetts. (The evaluators were assisted by Marge Stockford with some aspects of data gathering and analysis.) The ambitious 4-year plan to expand and deepen the use of technology in support of adult basic education was made possible by a significant commitment of resources and energy on the part of DOE. This commitment was intended to enable programs in the Massachusetts adult literacy system to build the infrastructure, skills, and overall capacity needed for the effective use of technology in support of teaching, learning, and program management.

MALTT is an ad hoc group of practitioners in the field who began to meet informally to promote and advocate for the expanded use of technology among adult literacy practitioners and provider organizations. MALTT developed a wide-ranging set of recommendations that became the basis for the plan that was adopted and funded by DOE. In addition to its vision that the creative use of educational technology could improve the quality and effectiveness of adult literacy programs, DOE also wanted to increase the technological capacity of the organizations its funds because it has been implementing a statewide client data management system, called SMARTT, as a major vehicle for program accountability and data resource to drive strategic decision making at both the program and state levels.

The purpose of this evaluation was three-fold: to assess the success in implementing the MALTT technology plan, to understand what worked and didn't work in terms of the expanded effective use of technology in the programs, and to generate a set of recommendations for the next multi-year phase of technology infrastructure development and capacity building in the adult literacy field in Massachusetts.

Evaluation Methodology

The evaluation design was developed on the basis of a participatory process involving the evaluators and an evaluation advisory committee composed of representatives from DOE, the System for Adult Basic Education Support (SABES), and MCET. This committee also met with the evaluators to review preliminary data and discuss the content and format of the evaluation report. The data gathering that was conducted for this evaluation included the following:

1) Detailed written surveys completed by representatives of individual program sites (typically completed by the technology coordinator or program director). The surveys provided an opportunity for respondents to reflect on issues related to the site's technology infrastructure, patterns of use of technology, and perceived barriers to the effective use of technology. The surveys were completed by 92 sites, representing 36.7% of the 251 program sites funded by DOE. The breakdown of the survey respondents by region is as follows: Boston 25, Northeast 21, Southeast 14, Central 12, West 20.

2) In-depth follow-up telephone interviews of 50 survey respondents (again, typically the technology coordinator or program director). These interviews were designed to clarify and deepen the survey responses and to explore specific aspects of infrastructure development and patterns of technology use at the programs. The breakdown of the survey respondents by region is as follows: Boston 12, Northeast 12, Southeast 8, Central 8, West 10.

3) Multi-agency staff focus groups conducted in each of the 5 regions. There were a total of 42 participants in these focus groups. The number of participants by region were: Boston 9, Northeast 14, Southeast 5, Central 7, West 7. The number of participants by job title were: Director 10, Technology Coordinator 22, Administrative staff 5, Teachers 5. (Note: The Technology Coordinators usually indicate that they hold a second position as well.)

4) Site visits to the following organizations. These site visits typically included interviews and focus groups with staff and learners as well as observations of activities in the computer lab and in classrooms. (Note: The programs indicated by an * are the four sites of the Distance Learning Pilot Project, a special initiative funded by DOE and supported by MCET and SABES that provided resources for these four programs to explore distance learning methodologies.)
    - Haverhill Community Action
    - ACCCESS (Cape Cod Community College) *
    - Operation Bootstrap
    - Lawrence Adult Learning Center
    - International Language Institute of MA *
    - Massachusetts College of Liberal Arts *
    - Pittsfield Adult Literacy Program
    - Somerville Center for Adult Learning Experiences (SCALE)
    - Continuing Education Institute's mobile classroom at Newton North High School
    - International Institute of Greater Lawrence *

5) Weekly e-mail questions sent to a list of 50 program staff over five weeks. The staff who received the e-mails were identified by the regional technologists. There were 20 individuals who responded to the questions, and there were 15 who responded three or more times.

6) Brief written surveys completed by 208 adult learners currently involved with various adult literacy programs. These surveys focused on the learners attitudes about technology, as well as issues of current and desired uses of technology.

7) Written surveys completed by 54 program staff. These surveys focused on issues of current and desired uses of technology, success and challenges, and perceived barriers to effective use.

8) Detailed computer lab observation protocols completed for the following programs:
   - Pittsfield Adult Learning Center
   - VOC Adult Education Program
   - Uxbridge Adult Basic Education Program
   - Project Expand (Worcester County House of Corrections)
   - International Language Institute of MA: main site in Northampton
   - International Language Institute of MA: DL site in Springfield
   - Massachusetts College of Liberal Arts
   - Pittsfield Adult Literacy Program
   - Lawrence Adult Learning Center
   - Read/Write/Now
   - Plumley Village

Note: While an extensive amount of data has been gathered for this evaluation, that data does not cover every program or program site. The scope and budget for the evaluation were such that performance with respect to some objectives in the MALTT plan (especially those concerning technology infrastructure development or access to/use of technology for specified percentages of "all" programs or a certain number of programs per region) could not be determined precisely. The evaluators have endeavored to draw appropriate inferences from the data that was available, and the findings and recommendations in this report reflect their efforts accordingly.

The Process of Technology Integration

In order to provide a context for presenting findings and recommendations, the evaluators have outlined the following framework and set of guiding principles regarding the process of technology integration into educational settings. Successful integration of technology in an educational setting is not quickly accomplished or accomplished without thorough planning and a knowledge of teacher and learner needs and capabilities. Because effective teaching and learning with technology does not occur overnight, it requires a strong commitment from many of those involved in the educational experience. These include administrators, teachers, and learners. This commitment is demonstrated in the following ways:

- There needs to be a strong level of commitment from the administrators of the educational program. Commitment from administrators is reflected in providing adequate funding to support the purchase of appropriate hardware and software, the hiring of staff to support both equipment and teachers, and the broad-based participation of staff in training and professional development related to technology. Commitment from administrators is also reflected in decisions regarding scheduling and coverage that enable staff to attend training sessions and to practice and refine their skills. Finally, program administrators must help to set a tone and establish an

organizational culture that is conducive to risk-taking and innovation with respect to teaching practice and instructional methodology.

- There must also be a strong level of commitment from teachers. Commitment from teachers is reflected in the time they allocate to their own learning about technology and how to use it effectively in the curriculum. Commitment is also reflected in the teachers' ability to try new and innovative teaching techniques in order to provide learners with the best educational experience possible. Teachers should explore possible uses of technology and should seek out training opportunities regarding the integration of technology into the curriculum. The commitment of teachers can be seen in their willingness to develop new curriculum and problem solve issues related to the educational use of technology.

- Finally, there needs to be a strong level of commitment from learners. Commitment from learners is reflected in their willingness to develop their technology-related skills in order to become effective users of technology and to use technology to enhance their learning. Also, commitment on the part of learners includes understanding and abiding by the rules which are part of technology use within the educational institutions.

Commitment from all these participants is the first step in effective technology integration. Once this commitment is made, barriers to successful technology integration related to funding, hardware and software availability, training, curriculum development, maintenance, and time management are significantly reduced. Beyond this commitment however there are principles of effective educational practice that must be put into place in order to successfully integrate technology into an educational setting. These principles include:

a) Understanding that successful technology integration requires viewing technology as a set of tools to extend and enhance educational practice. Teachers need to use technology to aid learner understanding of various content areas, and not regard it simply as an add-on which is unrelated to a particular content area.

b) Thorough training of all staff involved in integrating technology with the curriculum. In order to understand fully what integration of technology requires, and how it is accomplished, teachers need to be trained on how technology enhances learner learning. (Not simply on how technological tools work.) Learner learning styles and how technology meets different learner needs must be addressed in teacher training in order for effective use to occur.

c) Development of curriculum which fully and meaningfully integrates technology into the educational setting. Lesson plans, templates, handouts, and activity sheets ready for classroom use need to be available for teachers to use as models as they develop their own lessons which include technology components.

d) Analysis of technology to determine how different hardware and software can best be used in an educational setting. Not all forms of technology are appropriate for all classes and all

settings. Teachers and administrators need to gain an understanding of when technology use is appropriate and meaningful and when it is not.

e) Teacher confidence and comfort related to use of a site's available technology. Teachers must know that when they plan to use technology with their learners, it will work as expected. If teachers need to be concerned about whether or not technology will function as it is supposed to, they will be much less likely to take advantage of the technological tools available to them. This means that specific staff at educational institutions should be charged with maintaining the technology to ensure its accessibility and use.

f) Comfortable and accessible space must be available. Space has to be created in labs and classrooms for the comfortable use of technology. A combination of technology access points is beneficial for learners who need to have access to technology both during structured class times and outside of class when they need to practice their skills or work on homework assignments.

g) Development of policies that outline appropriate technology use by all members of the educational institution's community.

h) Development of a thorough technology plan, which is reviewed and updated regularly, that outlines how technology will be used in the educational program as well as the goals and objectives of technology use must be developed.

These principles are intended to create a context within which to consider the findings and recommendations that follow. They also provide a framework for the implementation of the recommendations in that they inform a possible vision of effective use of technology in support of quality teaching and learning.

Findings

The findings and recommendations have been organized primarily into the three major categories of goals and objectives from the Massachusetts Adult Literacy and Technology Plan. In the MALTT plan, objectives related to access and use of computers by learners, teachers, and administrative staff are included in both the infrastructure and skill building sections of the plan. The evaluators have chosen to include a section that provides greater detail on the level and type of use of technology by these three constituencies, and have titled that section "Patterns of Use of Technology." The evaluators have sought to present their findings in a logical manner that creates the clearest overall picture of progress made to date regarding the use of technology throughout the adult literacy system. These findings in this report have been grouped into the following sections:

- Creating a Technology Infrastructure;
- Patterns of Use of Technology;
- Building Skills and Confidence;
- Providing Ongoing Support.

In each section, when appropriate, the report presents a summary of the relevant objectives from the MALTT plan in the respective category. The findings include an assessment, to the extent possible, of performance relative to the objectives.

Creating a Technology Infrastructure

Hardware and Software

The objectives in the MALTT plan regarding hardware and software are as follows:

Hardware

a) All programs will have at least the following:
   - three state-of-the-art computers
   - one large-screen monitor connected to a computer for large group instruction
   - videocassette recorder and camera
   - digital camera.

b) Eight to twelve programs per region will have the following:
   - computers connected in a Local Area Network with a server
   - Software to assist learners who have learning disabilities

c) The learner-to-computer ratio will not be more than 10:1, and will approach 5:1 as a best case by the end of Year 2.

d) At least two programs per region will have the following:
   - videoconferencing software;
   - a state-of-the-art, high-speed Internet-accessible, networked computer lab.

e) At least one program per region will have the following:
   - specific assistive technology, hardware and software, for learners who are physically challenged, or hearing or visually impaired.

Software

a) All programs will have a variety of useful, widely-used, state-of-the-art software, including:
   - productivity tools such as word processing, databases, spreadsheets, desktop publishing and graphics software;
   - tools for discovery- based learning such as discovery adventure games;
   - computer- based instruction software;
   - software for learning disabled (LD) learners;
   - Internet videoconferencing software.

Findings regarding progress in developing the technology infrastructure of the adult literacy programs are presented below. These findings have been drawn from the program survey

responses from 92 sites and 50 follow-up telephone interviews conducted with selected survey respondents.

a) For the purposes of the evaluation, "state-of-the-art" computers will be considered Pentium PCs, iMAC, or G3 computers. With this understanding, the program survey responses indicate:
   - 84 program sites (91.3% of the sample) have access to three or more state-of-the-art computers. However, 80 programs (87% of the sample) actually own three or more state-of-the-art computers.
   - Of the 89 program sites (96.7% of the sample) that have access to any state-of-the-art computers, the average number of computers is 16.6 (the range is between 1 and 102, and the standard deviation is 15.9). However, 87 program sites (94.6% of the sample) actually own at least one state-of-the-art computer (here the range is 1 to 58, with a standard deviation of 8.9).

b) The average learner-to- computer ratio (computed from the total number of computers and the number of learner "slots," for the 79 program sites for which we had both data points) was 6.7-to-1. There are 50 program sites (63.3% of the sample) with ratios of 5-to-1 or less. There are 12 program sites (15.2% of the sample) with ratios greater than 10-to-1, and 3 sites (3.8% of the sample) with ratios greater than 20-to-1.

c) 29 program sites (31.5% of the sample) have some type of computer projection system for group instruction.

d) 71 program sites (77.2% of the sample) have a VCR, but 29 sites (31.5% of the sample) have a video camera.

e) 29 program sites (31.5% of the sample) have a digital camera.

f) 69 program sites (75% of the sample) claim two or more networked computers. The average number of networked computers is 15.6. (The range is from 2 to 90 networked computers, with a standard deviation of 12.9.) It is not clear solely from the survey responses whether the networked computers at any particular program site constitute a true LAN with a server or are simply a group of printers networked for a specific purpose such as sharing a printer. There are some other indications, however. 51 program sites (55.4% of the sample) that indicate that more than one computer can access the Internet simultaneously, and it can be assumed that in most cases, simultaneous Internet access results from networked computers rather than multiple telephone lines or other connectivity. Also, in the follow-up telephone interviews, of the 43 program sites that had networked computers, 36 had either a single LAN in their computer lab or for the program as a whole. Three (3) of the sites interviewed had computers that were networked for the purpose of sharing a printer, and 4 sites had multiple LANs. (In these cases, there were two scenarios: one LAN for the computer lab and one for the administrative staff, or one LAN for PCs and one for MACs.)

Some additional noteworthy findings regarding the development of a technology infrastructure not specifically referenced in the MALTT plan objectives are as follows:

- Of the 1,039 computers claimed by the programs that were interviewed as a follow-up to the survey, the distribution among classrooms, computer labs, and offices is as follows: Classrooms: 217 (20.9%); Labs: 601 (57.8%), and Offices: 221 (21.3%) (Additional findings regarding the use of computer labs and the use of computers in classroom settings are presented in the section of this report on space and physical plant issues.)

- 89 program sites (96.7% of the sample) have at least one computer printer, and among these sites, the average is 5.2 printers. (The range is 1 to 29, with a standard deviation of 4.7.) There are 27 sites (29.4% of the sample) that have only 1 or 2 printers, and the average computer-to-printer ratio is 4.8 to 1. (The range is 40 to 1 to 1 to 1, with a standard deviation of 5.4.)

- 10 program sites (10.9% of the sample) have CD writing capability. (Note: No data was collected on the level and type of use this hardware and software has generated.)

- 56 program sites (60.9% of the sample) have scanners;

- 31 program sites (33.7% of the sample) have laptop computers. These programs have an average of 2.8 laptops (the range is 1 to 9, with a standard deviation of 2.1.)

- 5 program sites (5.4% of the sample) have laserdisc players. (Note: As laserdisc technology is replaced by CD-ROMs and DVD these will most likely be seen less and less in sites.)

- 5 program sites (5.4% of the sample) have satellite dishes.

The evaluation did not generate data regarding the presence of various specific pieces of software at the programs. However, there is substantial data regarding the use of particular software tools by teachers, administrative staff, and adult learners. This will be presented and discussed in subsequent sections of the report dealing with "patterns of use."

Overall, there has been a substantial amount of technology put in place throughout the network of adult literacy providers. The programs have focused on acquiring (or otherwise accessing) and utilizing computers, setting up computer labs, and implementing networks for the purpose of accessing the Internet. They have not focused on creating a similarly advanced infrastructure of video, CD, or satellite/broadcast technology. A number of the MALTT plan objectives appear to have been significantly exceeded, specifically the ones related to creating computer networks and developing the capacity to use computer projection hardware and software for group instruction.

Connectivity

The objectives in the MALTT plan regarding connectivity are as follows:

a) All programs will have state-of-the-art (i.e., high speed) connectivity through cable, high speed lines, satellite, or other means, and most of the program's computers will be connected in a local area network with access to the Internet.

b) All programs will have an Internet connection and "a minimum level of hardware."

c) Eight programs/region will have a LAN (with a server);

d) Two programs/region will have a fully-networked computer lab;

e) Two programs/region will have videoconferencing capability.

f) One program/region will have assistive hardware and software

g) 100% of the teachers will be able to access computers, and 90% will use hardware "regularly;"

h) 100% of the learners will access hardware, and 80% will use hardware "regularly."

(Note: Objectives "c" through "f" above are indicated in the MALTT plan as Year 1 objectives, and there are not similar objectives for Years 2 and 3. The findings below will address the aspects of connectivity referenced above, even though it is not clear what the final targets were. In addition, this section will address issues of access and frequency of use by teachers, administrative staff, and learners, even though terms such as "regularly" are not specifically defined.)

With regard to the extent of connectivity at the program sites responding to the survey, the data provided by some sites in response to separate questions in the survey is inconsistent and contradictory. For example, 12 respondents indicated a number of computers that can access the Internet simultaneously that is larger than the number of computers they claimed have Internet access when they were asked to breakdown that number by type of connection. Similarly, 68 respondents indicated some level of Internet access when asked how many computers could access the Internet simultaneously, while 81 indicated some level of Internet access when asked to break out the numbers of computers by type of connection to the Internet. The evaluators have tried to draw meaningful findings from this flawed data that implies trends in the extent of connectivity among adult literacy providers. With that caveat, the findings are:

- 68 program sites (73.9% of the sample) claim connection to the Internet, and among those, an average of 12.9 computers can access the Internet simultaneously (the range is from 1 to 98 computers with simultaneous Internet access, with a standard deviation of 17.8). Of those 68 program sites, 17 (18.5% of the entire sample, and 25% of the 68 sites indicating Internet access in this question) indicate that only one computer can access the Internet at any one

time. If a program site has the capacity to demonstrate Internet use to learners in labs or classrooms via LCD or other computer-projection equipment, and has teachers who are comfortable and skilled at teaching this way, the number of workstations at which to simultaneously access the Internet would be less critical. However, as discussed later in the "space and physical plant" section, teacher workstations and demonstration space in labs is small and underutilized, therefore in order for learners to use the Internet successfully they require the ability to access it simultaneously.

- 81 program sites (88% of the sample) indicate they have computers with access to the Internet in the portion of the survey in which they were asked to break out the numbers of computers with Internet access by type of connection (e.g., 56K, cable modem, DSL, etc.). Of these, 21 sites (22.8% of the entire sample, and 25.9% of the 81 sites), indicate that all their computers have Internet access (i.e., their total number of computers at the site matched their total number of computers with Internet access).

- 37 program sites (40.2% of the entire sample and 45.7% of the 81 sites indicating Internet access in this question) indicate they have some form of high speed Internet connection (i.e., a connection beyond a 56K or slower modem).

- 37 program sites that indicated their Internet connection is in use everyday were interviewed as a follow-up to the survey. Of those, 16 (43.2%) indicated that the internet is accessed everyday by both staff and learners, 15 (40.5%) indicated that only staff access the Internet everyday, and 6 (16.2%) indicated that only learners access the Internet everyday. (Additional findings on access by learners is available in the "patterns of use" section of this report.)

- 12 programs that indicated that their Internet connection is used infrequently (either once/twice per month or seldom if ever) were interviewed as a follow-up to the survey. The reasons given for the infrequent use of the Internet were:
    * There is only a single connection (4 sites);
    * The Internet connection was very new to the program (3 sites);
    * The site is a correctional institution, and therefore there is limited use, especially by learners (2 sites);
    * There is a lack of knowledge on the part of staff and learners (2 sites).

  (Note: The second and fourth items on the above list speak directly to the need of teachers and learners to receive training in how and why to use the Internet in teaching and learning. The need for this training is discussed in further detail in the "patterns of use" sections of this report.)

Access and Use of Technology

With regard to issues of access and frequency of use of technology by teachers, administrative staff, and learners, there are several sources of data. These include: the program surveys (in which a single site representative was asked to comment on access and use), the

follow-up telephone interviews (again with a single site representative reflecting on access and use), and the staff and learner surveys (in which respondents were asked to comment on their own personal access and use). Findings from these sources are presented below.

In the program survey, respondents were asked to rate on a scale of 1 to 5 the frequency of use of various technology applications or functions by learners, teachers, and administrative staff (1 = rarely, 5 = all the time, a blank or zero = no use). The evaluators have analyzed this data by counting the number of responses in 3 categories: any use (a response other than blank or zero), regular use (a rating of 3 or better), and frequent use (a rating of 4 or better). Findings from the surveys for the use of selected applications by the three constituencies are presented below. (Further detail related to these findings is included in the "patterns of use" sections of this report.)

a) Word processing is widely used by learners, teachers, and administrative staff. Regarding learners: 75% of the sites report at least regular use and 48.9% report frequent use. Teachers: 88% of the sites report at least regular use and 73.9% report frequent use. Administrative staff: 94.6% of the sites report at least regular use and 88% report frequent use.

b) Databases are created and used with broad regularity by administrative staff, but infrequently by learners and teachers. For administrative staff: 87% of the site report some use, 53.3% at least regular use, and 40.2% frequent use. For learners: 53.3% of site report some use, but 5.4% at least regular use and 2.2% frequent use. For teachers it is similar: 67.4% of sites report some use, 14.1% at least regular use, and 4.3% frequent use.

c) Similarly, spreadsheets are used with broad regularity by administrative staff, but significantly less frequently by learners and teachers. For administrative staff: 94.6% of the site report some use, 62% at least regular use, and 38% frequent use. For learners: 62% of site report some use, but 16.3% at least regular use and 3.3% frequent use. For teachers: 76.1% of sites report some use, 26.1% at least regular use, and 8.7% frequent use.

d) There is a good deal of use of the Internet and of e-mail by all three constituencies reported in the program surveys. These results are presented in the following chart:

	Research via the Internet			**Communication via e-mail**		
	Any use	Regular use	Frequent use	Any use	Regular use	Frequent use
Learners	73.9%	42.4%	21.7%	67.4%	32.6%	19.6%
Teachers	85.9%	64.1%	41.4%	85.9%	66.3%	48.9%
Admin	85.9%	66.3%	47.8%	88%	81.5%	73.9%

e) There is little to no use of videoconferencing among the program sites responding to the survey. Although some use is reported in slightly more than one-third of the responding sites (35.9%, 38%, and 39.1% respectively for learners, teachers, and administrative staff), not one of the responding sites reported even as much as regular use by any of the three

constituencies. (Note: Under the auspices of the Distance Learning Pilot Project, there was regular use of videoconferencing for planning among the four pilot sites and for staff development.)

f) A significant proportion of program sites are using computers for financial management. Among the responding sites: 85.9% report some use of spreadsheets or accounting software for budget preparation and/or financial management, 66.3% report at least regular use, and 51.1% report frequent use. (It is important to note that a number of programs contract for bookkeeping and financial management services, and would therefore not use their in-house computers for these functions. Therefore, these findings do not necessarily reflect those programs' capacity to use technology.)

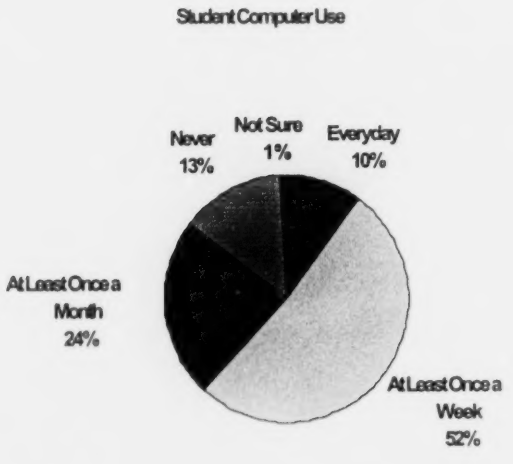
g) Many teachers are using the computer to prepare materials for their learners. Among the responding sites, 89.1% reported some use of technology for class and/or materials preparation by teachers, 76.1% reported at least regular use, and 52.2% reported frequent use.

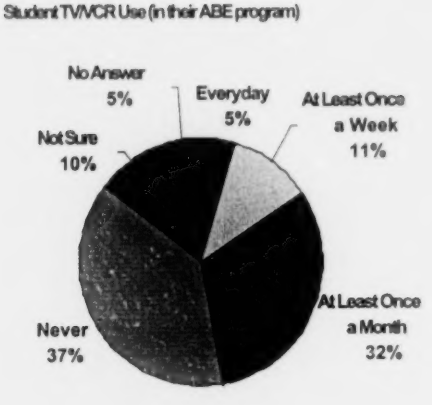
h) The various uses of technology that provide learners with the opportunity for self-directed, self-paced learning are only being used to a limited degree, with the greatest degree of use being with computer-assisted instruction. The following chart presents the percentages of responding sites reporting the frequency of use by learners of computer-assisted instruction, distance learning (sometimes referred to as "anywnere-anytime learning"), and courses or other instruction provided via the Internet, video, or other technology. (Note: This last description of a use of technology may be considered "anywhere-anytime" learning as well. The survey responses, along with the follow-up interviews and site visits, give the impression of widespread confusion and misunderstanding of what these methodologies are. It is also worth reiterating that the figures in the chart below represent the responses to the survey, and don't necessarily reflect the frequency of use by the sites of the Distance Learning Pilot Project.)

	% of sites reporting level of use by LEARNERS		
	Any use	Regular use	Frequent use
Computer-assisted instruction	63%	50%	30.4%
Anywhere-anytime learning	30.4%	2.2%	0%
Courses via computer, video, etc.	44.6%	20.7%	10.9%

The MALTT plan includes specific targets for the percentages of learners using hardware "regularly." This goal appears to have been achieved as it relates to use of computers, but it does not appear to have been achieved with regard to video and Internet technologies. 62% of learners surveyed reported they used computers in their education program either everyday or at least once a week, and 13% reported never using computers in their program. Only 16% of the same learners reported using a TV or VCR in their educational program everyday or at least once a week and 37% said they never used a TV or VCR in their educational program. Learner use of the Internet is not as low as that of TV or VCR however, 51% of those surveyed said they never used the Internet in their educational setting. 28% did say that they used it either everyday

or at least once a month. The compiled data from the learner surveys is presented in the following pie charts:





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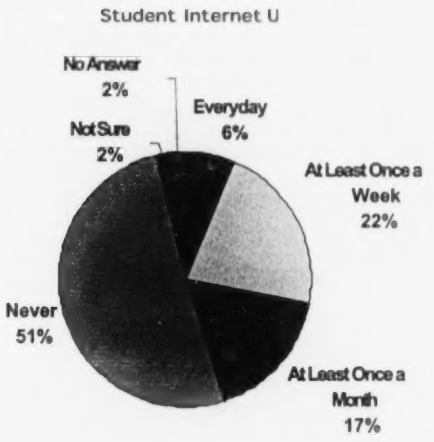


Learner comments on surveys reflect their interest in accessing and using technology more frequently. Comments such as, "Offer more technology classes." and, "Give more time on the computer." speak directly to this point. One learner wrote, "The most important thing in my opinion is that this program should make us practice in the use of technology."

The barriers to learner access to technology are not, in this case, primarily associated with the amount of technology housed in their educational setting. The sites evaluated for this report have computers, Internet access, and TV and VCR equipment. Learners lack access to the technology on a regular or frequent basis. (Many programs have built learners schedules so that learners have access to technology no more than once per week.) Programs lack reliability in their technology connections, appropriate space devoted to technology, high levels of teacher confidence and proficiency, and a technology-rich curriculum. All of these are essential to successfully integrating technology into an educational program. (Training and curriculum issues are discussed in greater detail later in this report.)

Reliable access to technology is critical to teacher and learner comfort in their use of technology resources. Stability is an issue for programs and sites that are not in control of the management of their technology. For example, problems have developed when a site's hardware, software, and networking is managed by a school system, or other entity, that is not intricately associated with adult literacy education. Staff at sites where technology is managed by another organization report that they lack control over what works at any given time, that they don't have control over what software is on the computers at any given time, and that they can't rely on a reliable connection to a network or the Internet.

Also at issue, in terms of reliable access, is appropriate staffing and staff training in order to troubleshoot common and advanced technology problems. Program technology coordinators reported that they did not have the time to troubleshoot and repair common and not so common technology problems. These problems range from fixing a jammed printer to more advanced

issues related to Internet connections and computer operating systems. When teachers and learners know that they won't be able to easily access support when using technology, they often decide it is better not to use the technology rather than end up having a problem that they can't handle and as a result not be able to complete a lesson. Two comments on surveys completed by program staff speak directly to this issue. Staff members wrote, "We need a technology person in the computer room who will help the teachers and learners when there are problems with the computers." and, "Support the equipment with a tech. coordinator."

Space and Physical Plant

An analysis of the data from the sites that completed the computer lab observation protocols generated the following findings:

a) In a large percentage of computer labs, workstations face a wall (87% of those who completed the observation protocols). Although this is not a detriment to computer use in itself, in many cases it does mean that learners cannot easily work cooperatively or see demonstrations by an instructor or fellow learners.

b) There are many sites at which there is minimal space at computer lab workstations for writing on paper or in notebooks, or to read manuals or other materials while working on the computer. 75% of those who completed the protocols responded that there is room for writing/reading at the workstations. However, 57% of those noted that there was very small space for doing so.

c) Sites are attempting to make supplementary materials available in the computer lab. However, 40% of the respondents report that these materials are difficult to access.

d) Sites are attempting to provide a space for teaching and demonstration in the computer lab, 75% of respondents note that there is at least a small space for such activity.

e) Instructor workstations are not common in computer labs; 50% of respondents reported that these did not exist in their labs.

f) Computer lab furniture is frequently not designed for computer use; 50% of respondents reported that the furniture in their lab was not designed for this purpose, and as a result the computer hardware does not fit well on the furniture.

g) Only one of the sites that completed the computer lab observation protocol noted that they had an inviting space that was conducive to both cooperative and individual computer work. Several of the sites noted that their computer labs were too hot, moderately noisy, and crowded. All of these present environmental barriers and act to deter learners and staff from successful technology use. As one technology coordinator wrote, "A stifling atmosphere (low ceiling, artificial lighting, no air circulation.")

It is common that the computer labs at adult literacy sites in Massachusetts are classrooms, often small classrooms, which have been minimally renovated in order to house the technology brought into the site. Ergonomically correct computer furniture or furniture that is accessible to learners with disabilities has not been purchased. Similarly there has been little thought regarding what constitutes a well-designed computer lab. Instead, sites and programs have scrambled to find space in which to house the new technology to which they need to provide access.

Computer workstations are located on top of tables that were previously used for other purposes. Similarly chairs are used which are not appropriate for sitting at a computer comfortably. As a result learners and staff work at computer stations that are too big for the furniture on which they are located. This means there isn't room to spread out papers and supplementary learning material, work cooperatively with peers, or simply sit comfortably for an extended period of time.

In these small areas peripherals are also often located in areas that are not conducive to successful use. For example, printers are housed on top of pieces of furniture that are not meant to house equipment of that type; as a result they are hard to access. Similarly there is not adequate space for a teacher to stand in front of a class to teach or to use a projection system and screen to demonstrate particular ways in which technology can be used. Other issues that were noted on the observation protocols were glare on computer screens and a noise level that makes it difficult to do work which requires quite study and/or individual practice.

There are examples of computer labs that have been designed to avoid many of these dilemmas. For example, Somerville Center for Adult Learning Experiences (SCALE) designed a highly accessible and comfortable computer lab. (Funds for the lab were provided by the City of Somerville.) The lab space is large with room at the front for teacher and learner demonstrations. Workstations are on computer tables that provide ample room for typing, computer screen viewing, and use of supplemental materials. When sitting at a workstation a learner can easily see the information on the monitor and also look up to the front of the room to see what the teacher or another learner is presenting. Information on the SCALE computer lab design is available on the web at: http://www.scalesomerville.org/main/labdesign.htm.

The design of the SCALE lab should provide a framework for what other sites need to strive to achieve for their computer labs. In order to use technology effectively ABE programs in the state need to not only buy equipment but also design areas in which that equipment can be used comfortably and successfully.

Computer labs are more common than computers in classrooms. Models of computer lab use have been developed in which teachers take their learners to the computer lab, approximately once a week, to take part in a specific lesson that integrates technology (usually a computer). Then, learners do not have access to the technology for another entire week. This computer lab model allows teachers to integrate technology into their curriculum in a manner that requires different skills than when computers are used within the classroom.

Management of one or several computers in a classroom requires planning and skills that are not familiar to teachers at most sites. Until teachers are familiar with how to manage learners' use of computers inside the classroom, and how to use the technology successfully themselves, computer labs are a viable method of technology access for learners and teachers. However, as staff becomes more familiar and comfortable with technology, classroom computers should be considered by each of the programs. Access to computers in the classroom will help to ensure that learners and staff do not have to wait a week in order to access this technology. Also, learners would have a better chance to become familiar with how technology is used and teachers would have a better opportunity to integrate technology into more areas of their curriculum.

Barriers to the Effective Use of Technology

In the program surveys, respondents were asked to rate a list of potential barriers to the use of technology for learners, teachers, and administrative staff on a 5-point scale (1 = not at all/not a barrier, 5 = major barrier). A synthesis of the ratings of the various barriers yields the following findings. (Note: Other barriers are also mentioned in the "patterns of use" sections of this report.)

a) The two most significant barriers, for all three constituencies (learners, teachers, and administrative staff) are: time and cost. These are inter-related in that they both relate to and impact access and thereby use of computers and other technology. There is a widespread perception that the effective use of technology as a teaching and management tool is a very time consuming process, and as such, it prevents some staff from even beginning to explore the possibilities. Increased funding could provide more staff and more technology, thereby increasing access as well as time for training and planning.

b) The lack of access to high quality and appropriate training, although not seen as a particularly serious barrier, is perceived as more of a barrier for learners and teachers than it is for administrative staff. Almost twice as many survey respondents indicated it was a major barrier (i.e., a rating of 4 or 5 on the 5-point scale) for learners and teachers than so indicated for administrative staff. Training for learners would presumably come from program staff, many of whom may not yet be fully trained and prepared themselves. Teacher inability to access training may be again related to time, which may feel less of a barrier for administrative staff.

c) Access to hardware and software and the availability of appropriate software and curriculum were both rated as significantly greater barriers for learners than for teachers or administrative staff. More than twice as many respondents indicated these issues were major barriers (i.e., a rating of 4 or 5 on the 5-point scale) for learners than did for teachers and administrative staff. Typically, learners' class schedules along with their work and family responsibilities leaves only limited time for additional work in the computer lab or with other technology. The ratings by the survey respondents regarding the availability of appropriate software and curriculum appears related to a lack of knowledge on the part of staff regarding such software and curriculum. This implies the need for training, and for a service whereby

software and curriculum are screened, evaluated, and recommendations are made to staff who don't have the time for such exploration and planning. (Note: There are a variety of such services, available free on-line. Some are listed on the Adult Literacy Resource Institute's Web site at: http://www.alri.org/literacylist.html.)

d) While there is a great deal of hardware and software that has been put in place and is available to learners and teachers at programs, there are a number of factors that are perceived to limit maximum meaningful and effective use of the technology, including:
   - Unreliable or inconsistent Internet connections (e.g., one site uses a satellite dish which becomes unreliable whenever it rains);
   - General unreliability and the related maintenance and troubleshooting needs of the hardware and software, and the lack of staff capacity to respond in a timely manner (e.g., printers may be jammed for hours or days before someone takes a look at the problem and fixes it);
   - In-kind or donated hardware and software that can be unreliable (e.g., a site which has computers donated and serviced by a local business organization needs to wait for troubleshooting and service);
   - Lack of specific plans to use particular technology (e.g., presentation/projection systems are significantly under-utilized).

Resource Strategies Related to Building a Technology Infrastructure

There are several important findings related to funding and resource development strategies that programs have developed to build their technology infrastructure. These include:

a) As mentioned above, a number of programs access resources and technical support from host institutions (such as schools systems or community colleges) but there are often constraints or limitations to access within these relationships. These limitations include inconsistent hardware service and troubleshooting and the lack of control over types of technology (both hardware and software) available. Reliance on a host institution can also become dependence, i.e., if a program site is reliant on an institution to maintain and manage their technology it is possible that staff at the program will not acquire the skills they need to successfully integrate technology into the classroom.

b) Some programs have been creative in accessing non-DOE funding (For example SCALE's use of funds from the City of Somerville to build their computer lab, or the successful efforts of the International Institute of Greater Lawrence, one of the Distance Learning Pilot Project sites, to access a Federal Community Technology Center grant) to support their development of a technology infrastructure, but many don't have any additional funding or support. The inability of programs to access external funding for technology is described as related to the lack of time for writing grants and/or cultivating prospective donors, and to a lack of skill, knowledge, and experience regarding strategies for identifying and pursuing technology-related funding opportunities.

c) Programs need to develop strategies for collaborating to access all the potential technology resources in the community (e.g., collaboration with foreign language radio programs, work with libraries, etc.). For example, at the Massachusetts College for Liberal Arts, technology-related collaboration has been developed with local libraries and with the Massachusetts Museum of Contemporary Art. These collaborations not only provide learners with the opportunity to become involved in the community, they also provide technological and personnel support for each of the participating institutions.

Integrated Infrastructure Planning

Before considering the following findings regarding technology planning at the program level, it is important to understand issues related to the life cycle of particular technology, the purpose of technology in a particular setting, and plans for its use on both an infrequent and regular basis. Questions that guide this self-reflection include:

- Is it important that the technology be "cutting edge?" If it's important to always have the fastest and best technology available, then upgrades will be required more frequently than if there is not a cutting edge requirement.

- Are there new technologies to which it is essential to have access? If there is a technological development that requires new purchases and upgrades, then the projected life cycle of current technology may be interrupted.

- What will computers be used for and by whom? If learners and staff will be spending most of their time using computers and other technologies for basic skills training that doesn't require high-tech components and speed, then it is likely that the life cycle of the technology could be 3 years, 5 years, or more.

- Are software upgrades necessary or important? Certain pieces of software may need to be updated on a regular basis in order to keep content current. However, applications often do not require upgrades unless it is determined that improvements available, via an upgrade, enhance learner learning or staff proficiency.

Of course computers and other technological devices will break and need to be replaced. However, armed with answers to the above questions it is easier to make good decisions about what to purchase and when it will be required to infuse the program with new pieces of technology.

In the telephone interviews conducted as a follow-up to the program surveys, program representatives were asked to reflect on the planning process their organizations use for technology-related purchasing and resource allocation decision making. The responses, paraphrased for clarity and grouping purposes are presented below. (Note: The numbers in parentheses are the number of times that particular response was given.)

a) Make decisions in accordance with the technology plan (with varying degrees of input from staff, learners, and representatives of the program's host institution) (15, or 30% of the sample)

b) Director and/or Technology Coordinator decide with varying degrees of input (from staff, host institution, learners) (13, or 26% of the sample)

c) Director and/or Technology Coordinator decide (10, or 20% of the sample)

d) Host institution makes decision, program has little control or input (10 or 20% of the sample)

It is important to note that there are differing perceptions about how much of the decision making regarding building the technology infrastructure of programs is determined and prescribed by DOE regulations.

Continuing to Build Infrastructure: Programs' Wish Lists

In the program surveys, respondents were asked to indicate what resources they would need to continue building their technology infrastructure, and what specific activities or acquisitions they would implement in 2000-2001. There were 61 program sites that responded to this question in the survey, and the results were as follows. (Note: The list has been paraphrased for brevity, clarity, and grouping purposes. The number in parentheses is the number of respondents who gave that answer; if there is no number, that means that only one respondent gave that answer. Respondents could give multiple answers, so the total may be more than 61.)

a) Establishing or upgrading their Internet access (19)
b) More workstations, establishing or expanding computer labs (16)
c) Software and hardware upgrades (15)
d) Improving or expanding the networking of computers (12)
e) More technology-related training for staff (10)
f) Digital camera (8)
g) More technology-specific staff (7)
h) DL technology, video conferencing (6)
i) Laptops (3)
j) More or upgraded printers (3)
k) Video editing equipment (2)
l) CD writer
m) Scanner
n) Computer projection system

There are several inferences that can be drawn from an analysis of these "wish lists." Many of the program sites have gone through an initial phase of purchasing computer hardware and software, and are now focused on upgrades and enhancements, rather than simply acquiring more computers. The focus among many programs on networking their existing computers and expanding or upgrading their Internet access also appears to be a "phase 2"-type request. In the

short-term, these programs do not need to buy additional hardware, they have to maximize the meaningful use of the equipment they already have. However, there are also a number of programs for whom the priority is still to purchase more workstations in order to expand access for learners and teachers. Many programs, whatever their needs and desired next steps in terms of building their technology infrastructure, express the need for support and consultation regarding purchasing decisions and negotiating with technology vendors.

There was a significant level of interest in expanding technology-specific staffing and in providing training for staff in technology, but there are indications that the desire for more training and increased staffing for technology is greater than indicated in these survey responses. (The way the question was posed in the survey might tend to solicit hardware and software responses, rather than training and staff. Also, many programs get their training through SABES, and that training is at no cost. Because this questions concerned future program budgets, respondents may have focused on larger expenditures they anticipate making.)

Other data regarding the needs and desired next steps on the part of program staff is contained in the brief written surveys completed by participants in the regional staff focus groups. In this survey, participants were asked to list the one or two recommendations they had that would support a more effective use of technology at their program. More training for staff and enhanced access to and use of the Internet both were mentioned by 40.5% of the respondents (17 out of 42). The other three categories of recommendations that were made (support for the integration of technology into the curriculum, more time and training for the Technology Coordinators, and software and hardware upgrades) all were mentioned by less than 10% of the participants. (As mentioned previously some of this data is contradictory to what was gathered via various other means. The following sections report data that demonstrates high interest in time, training, and a stronger technology coordinator role.)

The SMARTT System

The Massachusetts Department of Education has taken an ambitious and important step toward creating meaningful program evaluation and accountability in adult literacy through the statewide implementation of a student data and outcome tracking system called SMARTT. The development, refinement, and implementation of this system has been a major undertaking, and is nearly complete. The process has driven a greater awareness of the need for building technology capacity at the program level, and has motivated a desire for increased interaction with the SABES regional technologists. However, this process is, unfortunately, perceived by many programs as having been a major distraction that has served unintentionally as a barrier to the development of their capacity to use technology in support of teaching and learning. Concerns about the SMARTT system include:

- The amount of time required from Technology Coordinators and administrative staff at the program level to manage the system;

- It has unduly preoccupied the SABES regional Technologists;

- It is particularly difficult to implement at multi-site programs;

- The system has not been designed to feedback meaningful and useful data to the programs; it seems to exist primarily to capture statewide data for funding and policy decision making at the state level.

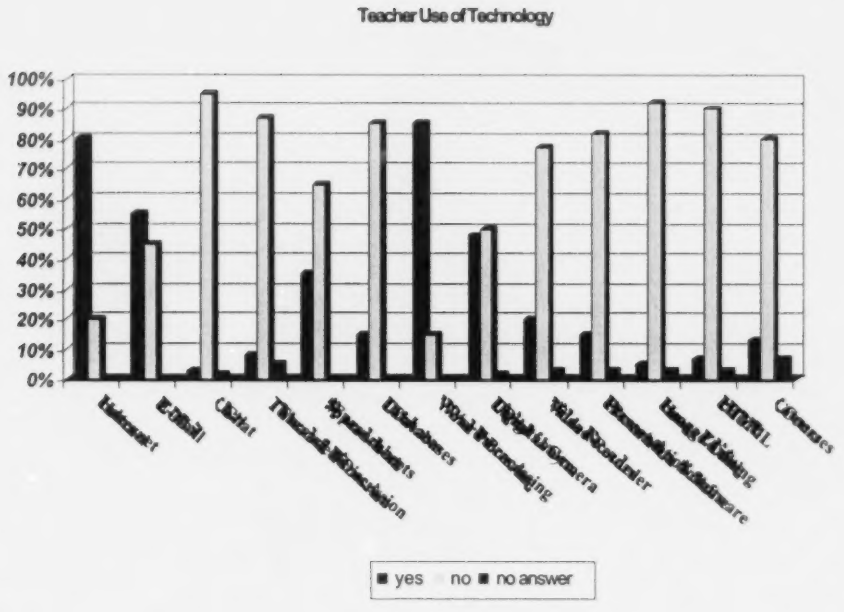
Patterns of Use of Technology

Teachers

A technology coordinator noted, "Creative teachers do creative things with technology." The MALTT Technology Plan outlined a comprehensive framework for the ways in which teachers would use technology by the final year of the Plan. Unfortunately, few teachers have succeeded at integrating technology to the degree suggested in the plan. Teacher surveys demonstrate that use is strongest in technologies and applications that are commonly used by the general population: Internet, e-mail, and word processing. Unfortunately, teachers have little use of, or experience in, technologies which are not as common and which may require a higher learning curve. These include databases, chat, presentation software, and HTML.

In the surveys, teachers were asked to indicate what technologies or applications they have used at their programs, how successful they regard their use to have been (on a scale of 1 to 10, 1 = not at all successful, 10 = extremely successful), and what level of priority they would assign to expanding their use of that technology or application (on a scale of 1 to 10, 1 = not interested/not a priority, 10 = very important/highest priority). The surveys also asked respondents to comment on their particular types of use of the various technologies and application, and to provide some information about barrier to use.

80% of staff reports they use the Internet regularly, 55% use e-mail on a regular basis, and 85% use word processing frequently. Many teachers (48% of respondents) report that they use digital cameras in the classroom. (Note: The sample of teachers for this question was small. It is suspected that the 48% claiming classroom use of digital cameras is unduly high.) The graph below shows the breakdown of teacher use of a variety of computer applications.



The most common use of the Internet by teachers is in finding and using web sites to complement instruction. At SCALE teachers develop Internet scavenger hunt worksheets for learners. At the Pittsfield Adult Literacy Program (PALP) teachers locate web sites that complement learner field trips. In surveys teachers noted they use the Internet for professional reference, in lesson planning, and to help learners connect with people in the countries from which they emigrated.

With regard to teachers perceptions of the degree of success they have had using various technologies or applications:

- 54% of the teachers rated their success with the Internet between 8 and 10.
- 9% rated their success as unsuccessful with ratings of between 1 and 3.
- 34% rated their success with the Internet as average with ratings between 4 and 7.

While the majority of teachers thought they had varying degrees of success at Internet integration:

- 55% of the respondents thought it was important to expand their use of the Internet in the classroom. (Teachers did not report as much interest in expanding the use of any other technology or application.)
- Only 3% of the respondents reported that expansion of their use of the Internet was not a priority.
- 32% of the respondents considered Internet expansion to be of average importance, giving expansion a rating of between 4 and 7.

Yet, when asked what barriers they faced in successfully integrating the Internet into the classroom two themes were repeated regularly. Teachers stated that they didn't have enough training and knowledge of how to use the Internet and they didn't have enough time to learn how

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to use it. Therefore it can be said that their own lack of knowledge about the Internet and how it can be used is the predominant barrier to successfully using it as an educational tool in the classroom.

The same barriers hold true for teacher use of e-mail in the classroom. On teacher surveys the most commonly stated reason for not using e-mail more frequently was lack of time and an understanding of how to use various e-mail components. Teachers who are using e-mail report that they are using it for sending communication to co-workers and learners. Teachers use e-mail to help learners communicate with learners in other classes, people in their home countries, and key-pals in other parts of the world. Of those teachers who use e-mail:

- 54% of the teachers thought they were extremely successful using e-mail
- 14% thought that their successes were limited.
- 32% of teachers rated their e-mail success as average.

When asked about their interest in expanding e-mail use in the classroom:

- 39% of teachers thought that it was important to expand the use of e-mail in their classroom.
- 6% rated e-mail expansion as not being a priority.
- 18% of teachers rated expansion of e-mail as an average priority
- 37% of teachers didn't rate expansion as any type of priority.

It is interesting to note that other Internet communication formats, chat and threaded discussion lists for example, are highly under-utilized by teachers.

- Only 1 teacher (3%) reported ever using chat.
- The teacher using chat rated her success as moderate and her priority to expand use in the classroom as average
- 3 teachers (8%) reported using threaded discussion lists. (However, there is confusion among teachers as to what threaded discussion lists are. Some teachers thought they were they same as e-mail mailing lists/listservs.
- The teachers using threaded discussion lists rated their use as highly successful.

Teachers' lack of knowledge regarding these two other communications functions is seen in their lack of interest in expanding use:

With regard to chat:

- 57% of teachers didn't reply to the question regarding priority to expand chat use in the classroom.
- 6% reported chat as being a high expansion priority.
- 19% gave chat expansion a low priority
- 15% rated chat as having an average expansion priority. (The teacher using chat fell in this category.)

With regard to threaded discussion lists:

- 74% of teachers didn't reply to the question regarding priority to expand threaded discussion lists in the classroom.
- 6% reported threaded discussion lists as a high expansion priority

- 14% gave threaded discussion a low expansion priority.
- 7% rated discussion lists as an average expansion priority.
- Teachers reporting that they used discussion lists in the classroom varied on their thoughts regarding expansion priority. One teacher gave it the highest priority, one gave it the lowest priority, and one gave it an average priority.

As noted above, 85% of respondents reported that they use word processing. Even though the teachers taking part in the survey reported that they felt successful with their use of word processing in the classroom, they also noted that barriers existed. These barriers were again related to training and time for learning how to use all the features of the word processing program. Teachers also noted that it is sometimes difficult to use word processing with learners who are not native English language speakers.

A majority of teachers who use word processing feel that they have been successful in their use. Some additional analysis of the data on this point is as follows:

- 49% of the teachers responding to the survey rated their success with use of word processing at the highest levels of the rating scale.
- 11% reported that they felt their use of word processing was unsuccessful
- 40% rated their word processing use as average in terms of success.

Teachers are using word processing in the classroom for writing reports and business documents, as well as creative writing assignments. Teachers also consider expansion of word processing use in the classroom to be a high priority:

- 52% of the teachers responding to the survey said that expansion was a high priority. (Second in priority only to the Internet)
- No teachers rated word processing expansion as a low priority. However, 24% of those responding to the survey did not rate expansion of word processing at all.
- 24% rated expansion of word processing as an average priority.

As the graph above shows, use of other technologies and applications, by teachers, studied for this report is below 50%. After the Internet, e-mail, and word processing digital cameras are the most commonly used form of technology. As stated above 48% of teachers use digital cameras. Digital cameras are often used by learners to incorporate into a word processed biography or autobiography. They are also used for web site images, yearbook images, and bulletin boards.

Teachers who use digital cameras rated their success:

- 47% at the highest levels of the rating scale.
- 16% reported that they felt their use of digital cameras was unsuccessful
- 37% rated their digital camera success as average.

The barriers to successful use of these cameras in the classroom are, as with the other technologies, time and a lack of training and knowledge of how to use the tool. Of the teachers who reported using digital cameras in the classroom:

- 27% of teachers rated expansion of digital camera use as a high priority.
- 10% of teachers rated expansion as a low priority.

- 27% of teachers rated expansion as of digital camera use as an average priority.
- 37% of teachers did not rate the expansion priority of digital cameras.

The MALTT Technology Plan notes that staff should be able to "word process, record information in databases, use spreadsheets to teach math...." As mentioned above teachers are integrating word processing into their curriculum regularly. However, the use of spreadsheets and databases is not as common. Specific findings from the teacher surveys relative to this point include:

- 35% of teachers reported that they use spreadsheets.
- 15% of teachers use databases.

Commonly, teachers noted that the barrier to using these applications was, once again, time and training. Of those teachers using spreadsheets, a slight majority felt that they were successful in their use:

- 52% rated their use of spreadsheets at the highest level of success.
- 14% rated their success at the lowest level
- 28% felt their success was moderately successful.
- 1 teacher (7%) did not rate her success using spreadsheets.

Only one teacher who doesn't currently use spreadsheets gave her expansion priority of using the tool the highest rating. Other teachers who do not use spreadsheets rated expansion of their use of the application at the lowest level of the scale. (Or they did not rate their expansion priority at all.) However, the majority of teachers who currently use spreadsheets (7 out of 12) rated expansion as a high priority:

- 25% of teachers rated expansion of spreadsheet use as an extremely high priority.
- 15% of teachers rated expansion of spreadsheet us as a low priority.
- 8% of teachers rated expansion of spreadsheet use as an average priority.
- 52% of teachers did not rate expansion of spreadsheet use.

Of the teachers using databases:

- 34% rated their use of the application as highly successful.
- 16% rated their use of the application as not very successful.
- 34% rated their use of the application as moderately successful
- 1 teacher did not rate her success using the application.

In a comparison of expansion of database use with that of spreadsheets, teachers who did not currently use databases were more likely to report that they were highly interested in expanding database use than those who don't use spreadsheets. 11% of the teachers who currently don't use databases reported expanding use of the application as a high priority. Database expansion priorities of all teachers submitting the survey is:

- 15% rated expansion of database use as an extremely high priority.
- 9% rated expansion of database use as a low priority.
- 9% rated expansion of database use as an average priority.
- 67% did not rate their interest in expanding database use.

Teachers noted that teaching database and spreadsheet skills to ABE learners in low-level classes and learners in ESOL programs is difficult. It is likely that teachers are not aware of how these tools can be successfully integrated into the classroom. If they were aware of the uses of these tools and as a result were ready for integration, the above ratings would certainly increase.

The use of online courses and courseware was also noted in the MALTT Technology Plan as something that teachers should and would be doing within the period covered by the plan. As the above graph demonstrates, teachers have made few inroads in this area.

Only 13% of the teachers who responded to the survey have taken part in an online course. Barriers that were mentioned by teachers in this area were once again time and training. In particular a teacher noted that there isn't enough time to research what is available online. Teachers demonstrated that they hadn't even thought about preparing their own courses and using courseware in a distance learning model. (This excludes those teachers who are involved in the distance learning pilot project discussed later in this report.)

- 40% of teachers who have taken part in online courses rated their success as very low.
- 20% of teachers who have taken part in online courses rated their success as very high.
- 20% of respondents who have taken part in online courses rated their success as moderate.

Teachers who have taken part in online courses are interested in expanding their use of this technology; of these teachers, 80% rated their priority for expanding use as either a high or average priority. Of all teachers who submitted a survey there is a demonstrated interest in expanding use of this technology:

- 18% rated expansion of online course use as a high priority
- 8% rated expansion of online course use as a low priority
- 20% rated expansion of online course use as an average priority
- 52% of respondents did not rate expansion of online course use.

Teachers who have not taken advantage of online courses rated their interest in expansion as very low. This again is most likely a demonstration of the teacher's lack of knowledge about the technology and how it can be used in the classroom.

The use of video recorders, presentation and image editing software, and HTML is very low among those teachers that responded to the survey:

- 20% have used a video recorder
- 15% have used presentation software
- 5% have used image editing software
- 7% have used HTML (primarily converting a document to HTML using Microsoft Word.)

When asked about the degree of priority they would assign to expanding their use of each of these lesser used technologies:

With regard to video recorders:

- 50% of those who currently use video recorders rated expansion a high priority. 32% of those not using video recorders currently rated expansion a high priority.

With regard to presentation software:

- 30% of those currently using presentation software rated expansion a high priority. No teachers who are not currently using presentation software rated expansion a high priority.

With regard to image editing software:

- 50% of those teachers using image editing software rated expansion a high priority. No non-users rated expansion of image editing software as a high or average priority.

With regard to HTML:

- 66% of those teachers who have used HTML to create web pages rated expansion as a high priority. However 33% of those same teachers rated expansion as a low priority. No teachers who currently don't use HTML rated it as a high or average priority.

The issue of readiness needs to be addressed in light of the fact that the data collected demonstrates that awareness of a tool correlates to a teacher's desire to expand use of that tool. Without training and time however, teachers will not be able to increase their knowledge of what technologies and tools are available and how to successfully integrate them into their curriculum.

When discussing barriers to technology integration one teacher articulated a sentiment that was noted by other teachers and technology coordinators, "It's difficult to integrate technology into instructional time because time is so limited. There needs to be a recognition that technology has to be integrated into the curriculum." Even though this teacher has used technology creatively and regularly, she has found that, because she needed to cover particular content within the time provided to work with learners, she worried that by integrating technology she would possibly have to give up teaching some of the designated content. She also knew that the integration of technology would take time away from preparation of traditional lessons and she was aware that because learners need practice using technology, teaching specific content would take longer than if she was working with learners who had strong technology skills.

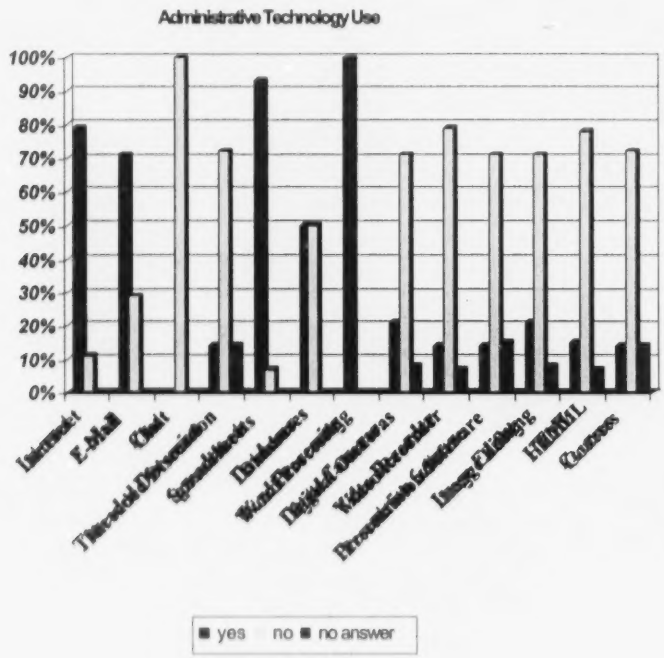
It's readily apparent from the data gathered that the major barriers to using all forms of technology and applications in adult literacy classrooms are training and time; training to learn how to use technology and applications, training to learn how technology can be integrated into teaching, time to learn how to use technology, time to practice, and improve technology skills, and time to build comfort and confidence with the use of technology in the classroom.

Teachers also need time to gather materials and prepare lessons that incorporate technology. In interviews teachers who use technology on a regular basis noted that the preparation time for a lesson increases dramatically when technology is integrated. Examples cited were the need to find web sites to incorporate into a lesson and the need to become familiar

with an application or tool before teaching learners how to use the same application or tool. It is likely that as teachers become more familiar with technology tools and applications this preparation time will decrease. However, as teachers gain the familiarity they need for extended preparation time must be recognized.

Administrative Staff

As is the case with teachers, the most commonly used technologies or applications among program administrative staff are the Internet, e-mail, word processing, and spreadsheets. The following graph shows administrative staff use of various technologies and applications.



As the graph demonstrates, 100% of the administrative staff responding to the survey, use word processing software. Staff reported that they use word processing primarily for correspondence and they rated their use of word processing as highly successful. Additional data analysis is presented below:

- 51% rated their use of word processing as a 10 and another 14% rated their use as an 8 or 9.
- No staff rated their use of word processing as minimally successful, however 21% did not rate their success at all.
- 14% rated their word processing use as moderately successful.

When asked to prioritize their desire to expand their use of word processing:

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- 50% rated expansion as a high priority with 42% rating it as 10 and 7% rating it as an 8.
- 7% (1 respondent) rated expansion as a moderate priority.
- 14% (2 respondents) rated it as a low priority.
- 28% did not provide a priority rating.

Although a majority of staff believes that they use word processing successfully, a majority still would like to expand that use. This relates directly to the issue of readiness and comfort with using a software application. As staff members gain confidence and feel successful with a technology or application, they become more interested in finding methods for integrating it more fully into their work at the program.

Spreadsheets run a close second to word processing in use by program staff. (This is a strong contrast to spreadsheet use by teachers and learners.) 93% of staff uses spreadsheets and they report using it for budgets and payroll, attendance reports, planning and staff charts. It may that the program staff more easily sees how spreadsheets can be integrated into their work than do teachers and learners. Of those who use spreadsheets (only 1 respondent reported that she didn't use spreadsheets.):

- 46% rate their use of spreadsheets as highly successful.
- 15% rate their use of spreadsheets as minimally successful
- 23% rate their use of spreadsheets as moderately successful.
- 16% of respondents did not rate their success with spreadsheets.

While there are quite a few staff members who believe they use spreadsheets successfully, there is a relatively large number who don't feel that they are using the application as well as possible. This may account for the large number of staff who rate expansion of spreadsheet use as a high priority:

- 57% rate expanded spreadsheet use as a high priority.
- 7% rate expanded spreadsheet use as a low priority
- 14% rate expanded spreadsheet use as an average priority.
- 22% or respondents did not designate a priority for expansion. (This includes the staff member who currently does not use spreadsheets.)

Time and training were noted by staff as being the primary barriers to effective use of spreadsheets.

Internet and e-mail use are also highly used by program staff: 79% reported using the Internet and 71% reported using e-mail. Uses noted for the Internet were for researching educational materials, keeping up with DOE information, and researching grants. Most commonly program staff use e-mail to communicate with co-workers, school departments, and others that they need to contact related to their professional duties. One respondent noted that she would like to know more about using special e-mail features, for example attachments. One respondent mentioned the need for more time to learn to use the tool effectively. However, a majority of those filling out the survey noted that they didn't face any barriers in using e-mail in their work. Staff using the Internet and e-mail report they have a high level of success:

- 50% rated their use of the Internet as highly successful with 65% of e-mail users giving their use the same rating.
- 16% of Internet users and 18% of those using e-mail rated their success as minimal.
- 34% of those using the Internet and 27% of e-mail users rated their use as moderately successful.

As with word processing, although a majority of staff feels they are successful using these resources, there is still a great interest in expanding their use:

- 42% rate expansion of Internet use and 57% rate expansion of e-mail use as a high priority. (This includes respondents who do not currently use the Internet or e-mail.)
- 14% of those using the Internet and 14% of e-mail users rate expansion as a minimal priority.
- 28% of Internet users and 7% of e-mail users rate expansion as an average priority.
- 16% of those using the Internet and 22% of e-mail users did not provide a rating for expansion of use of the tools.

100% of the administrative staff responding to the survey noted that a lack of time was the biggest barrier to using the Internet more frequently and more successfully. However, only one respondent thought that time was a barrier in expanding use of e-mail in her work. The majority of staff noted no barriers to effective e-mail use.

The lack of barriers in using e-mail may reflect the fact that it is possible to use basic functions (sending and receiving messages) of any e-mail program without intensive training. Yet, program staff may not realize that e-mail has many capabilities beyond those basic features.

The use of e-mail is in direct contrast to program staff use of other communications tools such as chat and threaded discussion lists. No staff reported using chat and no staff rated expansion of chat as a high priority. 28% did rate expansion of chat as a low priority and 7% rated chat as a moderate priority.

14% (2 respondents) of program staff reported using threaded discussion lists. (However there is confusion among respondents as to what are threaded discussion lists.) Of those who use threaded discussion lists 1 reported a high success rating and the other reported an average success rating. 7% of program staff rated expansion of the use of threaded discussion lists as a high priority, 7% rated the expansion as an average priority, and 14% rated expansion as a low priority.

Staff noted that lack of time and training were the biggest barriers to using these tools. This barrier is made apparent by the lack of knowledge of staff regarding threaded discussion lists. As most staff have not been exposed to these communications tools they cannot easily imagine how they would be integrated into their work.

Databases are used less frequently by administrative staff than spreadsheets, the Internet, e-mail, and word processing. 50% of respondents reported that they use databases to maintain mailing lists and for daily rosters. One respondent noted that she uses Excel instead of a database, but would prefer to use Access. Those using databases do have high level of success:

- 43% rate their use as highly successful.
- 14% rate their use as minimally successful.
- 43% rate their use as moderately successful.

Staff noted that training was the biggest barrier to using databases in their work. However, there is interest in expanding use of the application:

- 36% rated expansion as a high priority. (This includes one respondent who does not currently use databases in her work and 57% of those who do currently use databases.)
- 8% rate expansion as a minimal priority.
- 28% rate expansion as an average priority.
- 28% did not provide a priority rating for expansion of database use. (All of those who did not provide this rating do not currently use databases in their work.)

Staff also reported use of the following tools:

- 21% use digital cameras. An example is adding pictures to Power Point presentations.
- 14% use video recorders. An example is recording learner plays
- 14% use presentation software. An example is using Power Point for workshop presentations.
- 21% use image editing software. An example is editing images for Power Point presentations and web pages.
- 15% use HTML (primarily converting Microsoft Word documents to HTML.) An example is in the creation of a web page for a program site.
- 14% have been involved in online courses.

While each of these is used to a minimal degree by program staff, survey responses also demonstrated some interest in expanding the use of two of these tools:

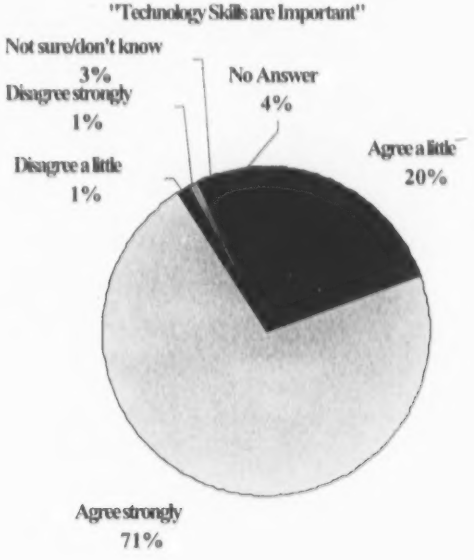
- 21% rated expansion of digital camera as a high priority.
- 28% rated expansion of their use of presentation software as a high priority.

These two tools are those that program staff see having particular use in their work; taking photos of learners, staff, and events at the program and creating presentations for workshops and teaching. The other applications and technology do not have uses which are as obvious to staff.

For each of these other applications and technologies staff say that time and training are the number one barriers to successful use in their work. These barriers are consistent for all of the technologies and applications covered in this survey. When combined with a general lack of knowledge about various technology and application capabilities, it is apparent that program staff require a strong training program that enables them to investigate technologies and applications and learn how to use them and how they can be integrated into their work.

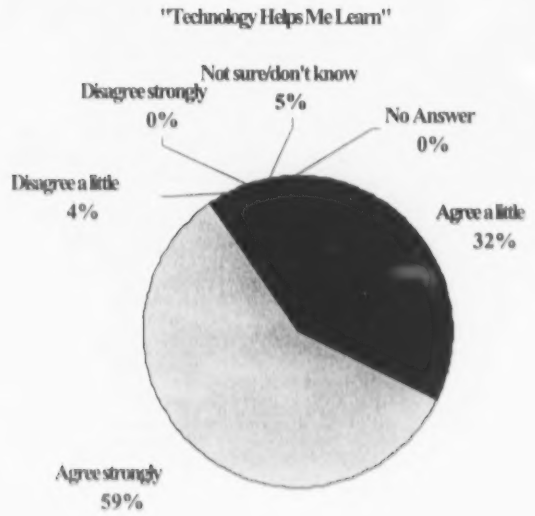
Learners

As noted above, 62% of learners surveyed use a computer at their educational program either everyday or at least once a week. In surveys learners were also asked how strongly they agreed with the statement, "It is important for me to have technology skills." 71%, as shown in the pie chart below, strongly agreed with that statement and only 2% disagreed either a little or strongly.



When asked why it is important to have technology skills, learners frequently answered that they need these skills for success in today's world. Learner comments on the topic included, "Technology skills are one of the basic skills for modern life." "It is a competitive world and you need to be prepared." "It is very important for me because if I have technology skills I will have good opportunities at the future."

Learners see that technology will help them be prepared for the future. They also see it as a tool to help them learn better. 59% of the learners surveyed strongly agreed with the statement "…using technology helps me learn better." The pie chart below shows that only 4% of the learners disagreed in any way with that statement. The comments that learners made about how technology supports their learning reflect directly on how they are using technology and applications in their adult basic education program. Learners wrote, "Technology gives me more choice to learn what I want to learn." "Because it helps me visually." "After I start using a computer my English is getting better."



It is most common for learners to visit the computer lab at their program once per week for 60 to 90 minutes. Among the ways that learners use technology during these times are in word processing documents, learning typing skills, accessing ESOL software and web sites, searching the Internet to locate information for classroom presentations, improving math skills with web sites and software, designing and creating web sites and watching videos to extend their knowledge of a piece of literature. Some specific examples include:

- At the International Language Institute (ILI) learners study areas of the United States and use the Internet to research their assigned state. On surveys ILI learners wrote that they used the Internet to improve English, they do this by visiting ESOL sites that include language tutorials. Learners also volunteer for an Internet team. In the past the team has created web pages, communicated with keypals in Brazil and New York City, and learned advanced Internet searching skills.

- At SCALE learners write autobiographies and biographies of classmates using word processing software. They take pictures, using a digital camera, of their classmates to integrate into the writing document.

- At PALP learners watch videos of stories they have read. After watching the video the teacher asks learners to compare the two versions through oral and written communication.

- At the Continuing Education Institute (CEI) learners learn Microsoft Word basics. The teacher demonstrates how to use features of the software to the class using a

computer projection system. Learners then practice their skills by creating letters, memos, flyers, and other types of documents.

- At the Massachusetts College of Liberal Arts, the eBay web site is integrated into the math curriculum. Learners also create web pages and by doing so teachers integrate reading, writing, and critical thinking skills.

Technology coordinators and teachers report that very few learners do not want to use computers as a part of their educational program. In fact, they find that technology is often a motivator for learners. What most often deters learners from using technology is, as referred to above, teacher integration of technology tools into the curriculum, regular access to technology (beyond a once-a-week visit to the computer lab,) and a knowledge of how to use computers and applications.

Many programs are struggling with how to provide learners basic computer skills so they can successfully use computer applications. There is question as to the best way to proceed. Should sites provide basic skills classes? Or should skills be taught on a "need to know" basis? (Teaching learners skills as they come up in their use of computers.) CEI, teaches basic skills classes, and does so at a remote location. Laptops were purchased specifically for these classes. Three times each week the teacher transports the laptops and projection system to a high school where learners sit in a classroom for several hours learning how to use Microsoft Word and other basic computer applications. SCALE sponsors evening computer literacy class for intermediate and above ESOL learners. These classes, which run in 9-week cycles, teach computer basics to learners. At SCALE learners do not use typing programs or learn basic computer skills as a part of their regular classes. Instead, teachers integrate computer skills into the lessons that learners attend weekly in the program's computer lab.

The MALTT Plan outline of learner uses of technology has, as with the plan for teachers and staff, been met with scattered results. Although some learners are using various pieces of software and the Internet for research, many learners are not using technology at all. Also, those learners who are using technology in their educational program do not have enough access in order to hone their skills and become proficient users.

Building Skills and Confidence

Training and Professional Development

The MALTT plan addresses issues of building technology-related skills and confidence among both teachers and learners. The issues related to the skill and confidence level of learners has been addressed in earlier sections of the report, and therefore, the evaluators have used the following section to address staff training and professional development issues.

There has been a great deal of well-regarded and well-received training provided to practitioners. However, there are many recommendations emerging from the staff interviews

and focus groups for improving the effectiveness and accessibility of the training. These recommendations include:

a) Provide opportunities to follow-up the training to reinforce the skills;
b) Schedule key trainings multiple times so staff can attend without waiting for an unduly long time;
c) Provide strategically selected training opportunities on-site at programs;
d) Technology training should be paid time for teachers who participate;
e) Technology training must be embraced as a high priority be program directors and staff leadership;
f) Find additional funding to access training beyond what is offered at no cost through SABES.

It is important that training for teachers be aimed at creating proficiency and comfort in the use of the hardware and various software tools. However, there must also be training that addresses issues of strategies for integrating technology into the curriculum and into the classroom.

Teachers need to build their hardware and software troubleshooting skills, so that they don't rely exclusively on the Technology Coordinator to deal with "glitches" when they arise. This is as important and valuable to the effective use of technology in support of the curriculum as is expertise in various computer applications.

An extensive list of desired training topics emerged from the staff interviews and focus groups conducted for the evaluation. Some of the more common requested or suggested topics include:

a) Using Microsoft Office applications as a classroom planning and management tool
b) Using Microsoft Office applications to teach specific subject area content
c) How to develop lesson plans which integrate technology
d) Using Internet communications tools to build learner community
e) Chat as a creative writing tool
f) Managing Internet projects
g) Building "tele-collaborative" projects among classrooms.
h) Managing the one-computer classroom
i) Troubleshooting your troubling PC
j) Finding information on the Internet
k) Designing your program's web site
l) How to setup and organize a computer lab
m) Teaching using technology

Technology Expertise and the MALTT Competencies

The MALTT plan states, "There will be at least one Gold level technology expert staff person in each program...." (The MALTT Team developed a detailed rubric for use by programs in assessing staff competency and overall program capacity to use technology. The definitions of

the levels of technology competency defined in the MALTT plan are available at http://www2.wgbh.org/mbcweis/ltc/alri/abecomps.html.)

Currently, program technology coordinators are the staff members closest to meeting the competencies outlined at the Gold level. Until there is more support for technology coordinators and teachers it will remain difficult for any member of the staff to reach the Gold level.

The data collected for this report demonstrates that there is an wide disparity in staff technology abilities and expertise. Yet, information regarding patterns of use as outlined above strongly suggests that most staff members remain in the Tin and Bronze levels (with many teachers below the Tin level for several areas of the competencies.) In order for staff to move forward in their technology competency support needs to be provided. This support needs to be in the form of paid time to attend training and to practice skills learned during training sessions. Teachers interviewed for this report frequently noted that to become technology proficient they would have to take part in training on their own time and without pay. This is a major barrier for teachers' successful integration of technology in the classroom.

Providing Ongoing Support

The predominant barrier to the maximum effective use of technology is time. More time is needed by learners, teachers, administrators, and Technology Coordinators for tasks including planning, skills development, materials preparation, software exploration, etc. Staff who participated in interviews or focus groups for the evaluation are looking for ways to either have more time (which in most cases has funding ramifications) or to find external resources (and individuals) that can assume responsibility for some aspects of these tasks in a manner that would serve to take pressure off program staff. For example, there is a perceived lack of quality software that is appropriate to the adult learner population. There are related recommendations that practitioners be engaged (and funded) to create software, and that there needs to be expanded software previewing and validating through a clearinghouse-type resource. (Such a resource has been established by SABES, but it is not well known or widely utilized and needs greater marketing and visibility.) In the context of this overarching finding regarding the needs of the programs for ongoing support, below are presented findings regarding the various existing support resources.

Role of Program Technology Coordinators

In an interview one technology coordinator commented that she measures success in the number of teachers who transform their fears of technology into successful and effective use and in the number of learners who create meaningful projects through the use of technology. To have these successes it requires that the technology coordinator is available to work with teachers who have fears about technology. By working with these teachers the coordinator can help them overcome their fears and learn the benefits of technology use in the classroom.

There is unanimous agreement from technology coordinators that they cannot do their jobs successfully in the limited number of hours per week in which they are scheduled and paid to act in the coordinator role. The job is extremely demanding and requires knowledge of all aspects of technology – from hardware maintenance and troubleshooting to software applications and from network management to curriculum development. Technology coordinators are well aware of the need to work with teachers on using technology successfully in the classroom. It is common for technology coordinators to note that it is likely, since they weren't always and readily available for technology troubleshooting or to help teachers figure out effective technology practices, that teachers shy away from using technology with their learners.

The components of a technology coordinator's role potentially include:

- Teaching and working with learners (sometimes team teaching.);
- Training and staff development related to technology;
- Hardware and network installation, maintenance, and troubleshooting;
- Curriculum and program development;
- Tasks related to the SMARTT system including training and supporting other staff, data entry, troubleshooting, etc.;
- Strategic and long range planning regarding technology issues including purchasing, training, and curriculum development.

When asked how the technology coordinators position should be changed, teachers and technology coordinators said that they needed more hours. Technology coordinators estimated that troubleshooting and maintaining equipment could take 30 hours per week. They mention as well the lack of time for selecting hardware and software and handling issues related to licensing agreements and vendors. Current technology coordinators envision the position as full-time with one full-time equivalent as an assistant to the position.

Technology Coordinators (and Program Directors as well) need training and technical assistance in facilitating the process of program development and organizational change. While they may understand hardware, software, and curriculum issues, in general, they need to improve their skills related to creating change in their program's and the staff's orientation toward technology. This would imply skills such as team building, marketing, etc.

Role of the SABES Regional Technologists

There is a need to clarify the role of the SABES regional technologists, and to plan, with programs in the region, the strategic allocation of their time to specific tasks and functions. The SABES regional technologists have been involved to an extensive degree with the implementation and support of the SMARTT system, and have not been able to allocate the necessary time for capacity building activities at the program level such as training and technical assistance regarding the educational uses of technology, assistance with the development of technology plans, or facilitating the professional development and convening of the technology coordinators at the programs. There is interest in thinking creatively about establishing specialties and statewide responsibilities for particular regional technologists. In that context, it is important to note that all of the program-level issues of capacity and capacity building needs

addressed in this report (regarding infrastructure, skill building, and support) have their analog at the regional SABES level.

Recommendations

The following recommendations address issues related to the continuing development of a technology infrastructure at the program level as well as the training and support necessary to advance the programs' effective use of technology. Most of the recommendations have ramifications for individual programs, for SABES (at both the regional and statewide levels), and for the Department of Education, and hence they have not been grouped by these three constituencies.

There are three broad themes that link these recommendations, and that provide an overall framework for considering next steps regarding the expanded use of technology in support of adult literacy. These themes are:

- In general, less focus on hardware acquisition, a more strategic approach to training, curriculum integration, and maximizing the effective use of existing infrastructure;
- A strong focus on model development and best practice identification, with a related effort to document and disseminate these models and best practices throughout the system;
- Developing a strong capacity building focus that strategically defines the roles of the program technology coordinators and the SABES regional technologists.

Infrastructure Development and Access Issues

a) Identify those programs whose basic technology infrastructure is so limited that they could not effectively use technology to support teaching and learning at a meaningful level. Criteria for identifying such programs may include: no computer lab or no Internet access beyond what is minimally necessary for SMARTT. Support these programs to acquire sufficient computers to establish a lab, create a local area network within their organization, connect to Internet, and other infrastructure development in accordance with the programs' strategic goals and existing technology plan.

b) Programs need to be more strategic in planning the implementation of all aspects of their hardware infrastructure, including: wiring, networking, establishing dedicated lines, conceptualizing the balance of computers in labs, in classrooms, as mobile workstations (either desktops or laptops, etc.). They should consider the effective life-cycle of the technology they have already implemented, and should regard maintenance and upgrading (of both hardware and software), as well as overall technology planning, as ongoing activities.

c) For those programs that have developed a substantial technology infrastructure, focus the technical assistance and capacity building efforts in three areas: maximizing the effective use of their existing technology (which may involve some limited software and hardware purchasing), training and skill building for the staff, and the development and implementation of strategies for integrating technology into the curriculum.

d) Provide reference materials, consultation, and training for organizations related to hardware and software purchasing, negotiating with vendors, and other aspects of managing their technology infrastructure development. There may also be opportunities for joint purchasing that can result in more effective decision making and reduced costs.

e) Develop and disseminate guidelines and specifications regarding the design and implementation of computer labs and computer classrooms that address issues related to comfort and accessibility, instructional methodology, and the required hardware and software. Provide related training and technical assistance.

f) At the program level, the extent of technology implementation and the related scheduling of learners in the computer lab or computer classroom should enable learners to access technology at least twice a week in structured settings and other times in a "drop-in," self-directed basis. Program must recognize that there are resource issues (particularly related to staffing) that impact their ability to increase learner access to the recommended level.

g) Programs should build technology planning into their community planning process, so as to strategically access the full range of technology-related resources and assets in their communities, including Community Technology Centers (CTCs), community colleges, libraries, etc.

Training and Skill Building

a) Develop and disseminate various models, with corresponding examples of existing effective practices, for the use of technology to deliver adult literacy services. These models should address issues related to the needs and goals of the target learners, the educational rationale for making specific choices, the necessary amount of hardware, the software options, logistics and space utilization, scheduling and time constraints, learner flow, staff deployment, etc. The documentation of these models should include common problems and strategies for addressing them, and should include worksheets, learner materials, and the like that can support their replication in other programs. These models can serve as valuable references for teachers and can support informed decision making on the part of staff regarding their use of technology. (Note: There is an existing body of documentation regarding the use of technology in adult literacy programs in Massachusetts. These materials should be reviewed for completeness and usefulness as staff development resources, and then aggressively and strategically disseminated.)

b) Develop and offer training modules for teachers and administrative staff that focus on the following issues and topics:

- Curriculum development and technology integration with curriculum
- Management of learner use of computers in both classroom and lab settings
- Using technology to enhance instruction in specific subject areas
- Management of learner use of technology in limited blocks of time
- Learner assessment related to the use of technology
- Collaboration with community-based technology resources and organizations

c) Explore and develop ways to utilize the web for practitioner training and support and for delivering educational services to learners. Focus on using the full potential of the web for dissemination, interaction, communication, and research.

d) Develop and disseminate models for incorporating basic technology skills (including standard office applications) into the adult literacy curriculum. For programs that have chosen (or who would choose, once staff developed the requisite skills) to implement computer skills classes for learners apart from the basic adult literacy curriculum, develop curriculum and instructional resources that support those services.

e) Provide incentives (monetary, recognition, access to program resources) for staff to participate in technology related training.

f) Training modules should be developed for technology coordinators and other staff in computer and technology "troubleshooting" skills. At the program level, there should be a number of staff who can play the troubleshooting role within the program, so that other staff don't rely solely on the technology coordinator for that type of support. This issue of over-reliance on the Technology Coordinator applies in similar ways to all aspects of technology integration at the program level. Programs should aim to develop a group of staff among whom there exist the full range of relevant technology skills, knowledge, and expertise to support other staff within the program regarding the effective use of technology.

g) Develop and implement a training series for technology coordinators in the various skills and knowledge areas that will enable them to become a leader within their organization who can catalyze organizational change regarding the expanded and enhanced use of technology. Skills to be stressed in such a training series would include: meeting facilitation, training techniques, strategies for engaging reluctant staff members, the process of change within organizational systems, etc. Ultimately, programs and program staff need to find methods for managing change in their setting, and understanding that it takes longer than expected and requires a great deal of planning and support in order to be successful.

h) Beyond the content of technology-related training to be offered to teachers and administrative staff, training programs or series should present knowledge and skills in the most "hands-on," participatory manner possible, and should provide opportunities for follow-up so that program staff can revisit and refine their new skills after a period of use. There should also be the opportunity to access some sort of "on-call" support as a follow-up to training opportunities to deal with challenges as they emerge. Coordination between the SABES regional technologists and the program-level technology coordinators will be essential for this type of follow-up support.

Providing Ongoing Support

a) Shape and focus the job description of the program-level technology coordinator directly and strategically in response to the specific needs of the program. In most cases, it will be necessary to expand the funding for, and hence the available time of, the technology coordinator.

b) Shape and focus the responsibilities of the SABES regional technologists to include a wide variety of training and technical assistance support for the programs in the region to maximize their effective use of technology to enhance the quality of teaching and learning. While maintaining an appropriate role in the ongoing implementation of the SMARTT system, the regional technologists should also allocate time (and make it known they are available) to support infrastructure development, staff and learner skill building, and curriculum integration needs of the programs, and should play a major role in building the capacity of the programs, especially the capacity of program directors and program-level technology coordinators, to use technology.

c) Providing staff and learners with support in using a site's existing technology infrastructure is critical. Program staff require assistance in developing skills for managing relationships with outside technology providers. This includes, negotiating with school departments on the relationship between school technology personnel and ABE program staff and the role of school technology personnel in the management of program hardware and software. Program staff need assistance in developing negotiation skills for dealing with Internet service providers. (This is particularly relevant to the issue of reliability of access.) Staff needs to develop an understanding of what an Internet service provider can and should supply, how to select a provider, and how to work with a provider when access problems occur.

d) Many programs can identify a specific activity, structure, or acquisition that they regard as essential to the success they've had in terms of utilizing technology effectively. These are more than simply "best practices," but are fundamental catalysts of organizational change and development with regard to the use of technology. These activities should be documented and disseminated, and the respective programs should be somehow engaged to provide support to their colleagues and counterparts in the field. Examples of these "cornerstones of success" include:
    - A comprehensive integrated curriculum;
    - The selection of a package of language instruction materials, as opposed to isolated pieces of software;
    - The learner record management component of specific instructional software packages;
    - The decision to network the computers in the lab so that learners don't always have to use same workstation;

- Various forms of collaboration among teachers (such as: team teaching between the Tech Coordinator and another instructor, a division of responsibility for learning various pieces of multi-faceted software packages);
- A class in basic computer skills (offered during the weekly "elective" time);
- Understanding needs of the population (schedules, family issues, ...);
- Access to resources of host institution (video production, technical expertise, ...).

Policy and Funding Issues

a) Explore ways to support distance learning/anywhere-anytime learning models through the standard DOE rate-based funding structures. This will require defining quantifiable and reportable units of services for such self-directed instructional models. Similarly, develop meaningful ways to count and incorporate into the SMARTT data system learners who are accessing distance learning opportunities. (Note: Planning with regard to these issues has begun under the auspices of the Distance Learning Pilot Project by representatives of DOE, MCET, SABES, and the four pilot sites.)

b) Explore ways of providing access to new technologies through a central server. For example, DOE or SABES might create a web site for staff to access which linked to a wide variety of resources and communications opportunities.

c) Explore ways to fund computer-skills instruction for adult learners through the standard DOE rate-based funding structures.

The Technology Planning Process

A well thought out planning process is key to the successful implementation of technology in an educational setting. This process ensures that all essential areas are covered - from technical infrastructure to professional development. There are many components within the planning process and a technology plan. A useful reference resource, Guidebook for Developing an Effective Instructional Technology Plan, is available at: http://www2.msstate.edu/~lsa1/nctp/Guidebook.pdf

Programs need to develop the capacity to gather data, convene key constituencies, and develop short- and long-range plans in a systematic and timely manner. The following steps are recommended as a general outline of a successful approach to technology planning:

a) **Recruit and organize a representative planning team**: The team members should represent all the constituencies that will be implementing, using, or supporting the technology. A wide range of technology knowledge and expertise should be represented on the team, and the team should include those who have limited knowledge and those who are well versed in all aspects of technology use. It is important that the team also include those who have a working knowledge of curriculum design and integration and those familiar with professional development methods and strategies.

b) **Investigate needs and requirements**: Members of the planning team should research the requirements of the technology. This may include holding focus groups and meetings with all those who will be using the technology, talking to people who have been through the process previously, and discussing possibilities with experts in the field. By the end of the investigative process, the planning team should identify the goals, vision, and mission of the technology and the technology requirements associated with each of those goals.

c) **Develop the technology plan**: With the data and information collected during the investigation stage of the process, the planning team should be able to write the plan. The final document should include, but not be limited to, the following sections or components:

- Introduction to the planning process
- Process methodology
- Vision Statement, Mission Statement, and Goals
- Issues critical to the implementation of the plan. These can include professional development, infrastructure concerns, maintenance, funding, curriculum integration, new technologies, facility requirements including computer lab and classroom considerations, etc.
- Assessment methods
- Hardware and software requirements. These should be developed to meet the vision, mission, and goals of the plan and fit the technology required for professional development and curriculum integration.
- Implementation strategy. The implementation strategy should include reference to those responsible for carrying out the different components and an overall timeline for each of the steps. This should also include a list of steps for carrying out the plan and a list of budgetary issues that need to be addressed during the implementation phase.
- Budget. What will it cost to carry out the technology plan that is presented? The budget should include costs related to the development of a technology infrastructure, purchase of hardware and software, professional development, curriculum development, hiring of staff, and technology maintenance.

d) **Approval/Community Building**: Approval of the technology plan may be required once it is completed. Along with the approval process it is useful to distribute the plan to stakeholders for feedback. Hosting meetings where team members present the components of the plan and solicit comments from teachers, administrators, technologists, etc. is a useful technique for gathering feedback. This step in the process often proves essential to its future success. It allows those who are going to be affected by the plan's implementation to have a voice in the process.

e) **Implementation**: Once a technology plan is created the process is not over. After the document has been approved the timeline needs to be initiated. As implementation progresses members of the team should continually evaluate the plan and make changes as necessary. A technology plan is a living-breathing document that needs to be revisited, assessed, and revised or updated regularly.

Conclusion

There have been many successes related to the integration of technology in adult literacy programs in Massachusetts and the MALTT plan. These include a strong infusion of hardware and software into program sites and a general realization that integration of technology is a key component for successful adult education in the state.

A great deal of hardware and software has been implemented, and there have been many initial efforts to utilize technology to improve the quality of educational services and program management. The efforts over the past few years, while substantial, have been somewhat fragmented and not part of an overall coordinated strategy. The next phase will require a more strategic approach to all aspects of the programs' capacity to use technology effectively, including: staff training, staff deployment, curriculum integration, space issues, hardware acquisition and deployment, software selection and acquisition, potential partnerships and collaboration, etc.

Now that the hardware and software has been put into place in many programs, it will be important for MALTT II to provide a conceptual framework and the related resources that will enable agencies and their staff to use the technology they now have in an effective manner for themselves and their learners.